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54 Polyethyleneterephthalate bottle with a two-layered neck.

57 A bottle of polyethyleneterephthalate formed by stretch  
 blowing wherein the portion from the neck to the bottom is  
 subjected to biaxial orientation while the neck is of a  
 two-layered construction.

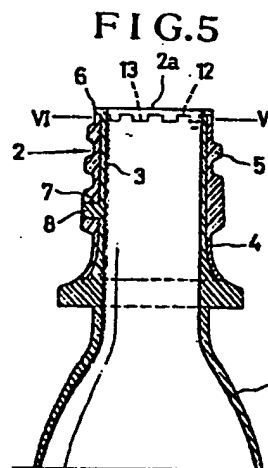


FIG.1

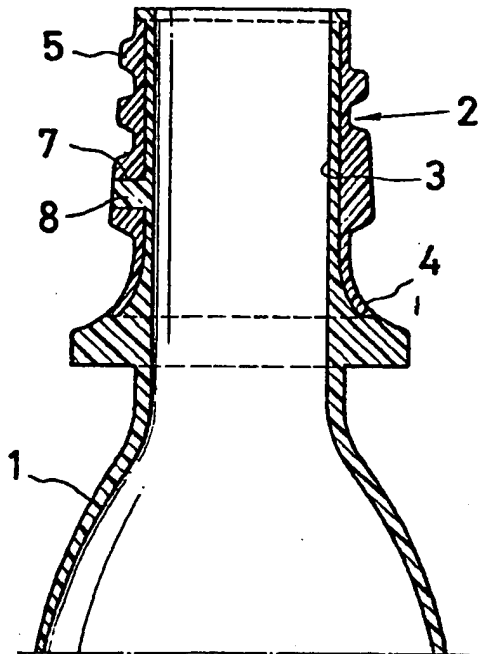


FIG.3

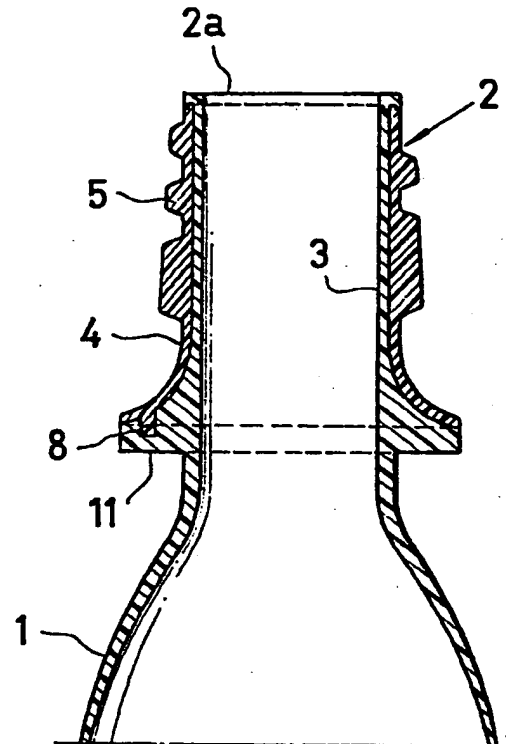


FIG.2

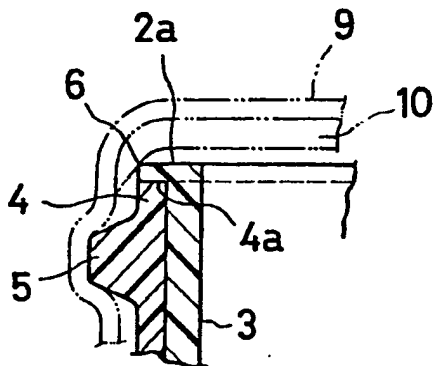


FIG.4

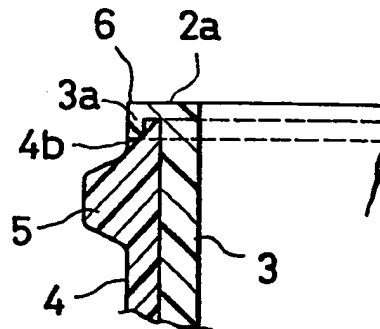


FIG. 5

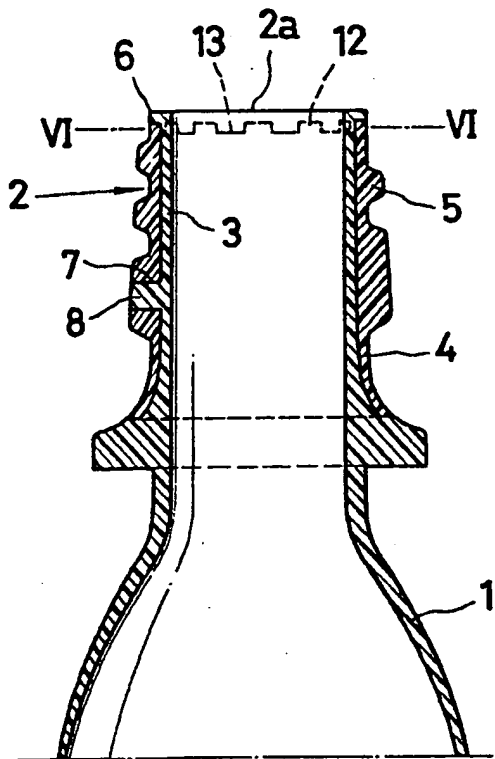


FIG. 6

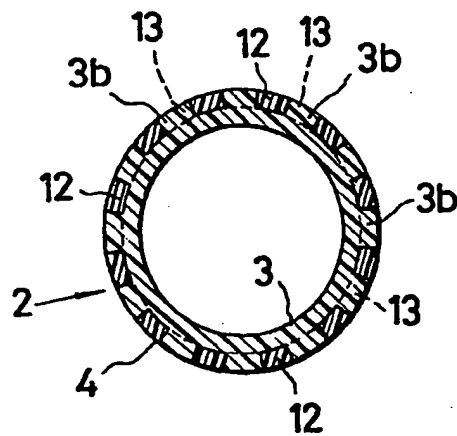
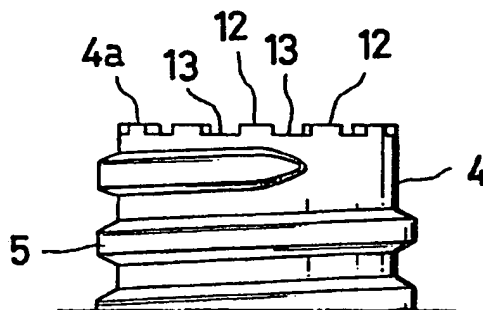


FIG. 7



## SPECIFICATION

1. TITLE OF THE INVENTION

POLYETHYLENETEREPTHALATE BOTTLE WITH  
A TWO-LAYERED NECK

2. BACKGROUND OF THE INVENTION

A biaxially oriented polyethyleneterephthalate bottle manufactured by axially stretching a premolded preform or a parison within a blow cavity and applying air blow thereto is small in permeability of gases such as oxygen, carbon dioxide gas, etc. and is excellent in pressure resistance, rigidity, transparency, etc., such bottles being used as bottles for carbonated beverage. However, the polyethyleneterephthalate is poor in heat resistance since it is low in molding temperature of bottle as compared with polyvinyl chloride resin and polypropylene resin. Therefore, where they are used as bottles for a liquid seasoning which are heated and filled at a temperature above approximately 80°C, molded bottles are further subjected to heat treatment to provide the heat resistance.

Most of polyethyleneterephthalate bottles manufactured by stretch-blowing are molded by holding a neck of an injection molded preform or a parison. For this reason, a portion subjected to biaxially oriented by stretch blow

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molding is below a neck positioned within the blow cavity, and the neck is in the state injection molded, which constitutes a neck of a bottle without modification.

Thermal deformation which occurs when the poly-ethyleneterephthalate bottle is heated and filled with contents is produced in both a neck and a bottle body. It is said that the thermal deformation of the neck is caused by the fact that the neck remains injection molded and not crystallized whereas the thermal deformation of the bottle body is caused by residual stress at the time of stretch blowing. This thermal deformation of the bottle body can be solved by applying heat above 100°C after the bottle has been molded to remove the residual stress. However, since the neck is formed in wall thickness greater than that of the bottle body, it takes time to crystallize it by heat treatment to provide a heat resistance.

In view of the above, an attempt has been made so that a neck of a bottle is made to have a two-layered construction, one layer being formed of metal or resin having a heat resistance. In this case, one layer having a heat resistance is provided internally or externally of polyethyleneterephthalate forming a bottle neck by insert molding but is different in properties from polyethylene-terephthalate, and therefore, an open end of the neck formed

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by two layers is deviated to produce a shoulder. Formation of such a shoulder results from a difference in heat shrinkage rate between polyethyleneterephthalate and a heat resisting member inserted into the neck, and even if the deviation in the open end resulting from the shrinkage difference is extremely small, a cap seal by mechanical means results in incomplete.

When the shoulder is produced in the open end of the neck, a clearance is formed between said shoulder and a packing on the side of the cap after the cap has been sealed, the content entered the clearance is permeated between two layers to separate the inner layer from the outer layer, which are once joined. Moreover, it is suffered from a drawback in that when the outer layer of the bottle is transparent, the external appearance of the bottle neck is impaired by a permeated liquid.

### 3. SUMMARY OF THE INVENTION

It is therefore an object of the present invention to eliminate the disadvantages noted above with respect to prior art and to provide a bottle wherein even if a bottle neck is of a two-layered construction, a deviation resulting from a difference in shrinkage is not produced in an open end of the neck, wherein even if an outer layer member

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having a heat resistance is inferior in gas permeability to polyethyleneterephthalate, the gas permeability in the bottle neck can be prevented by using polyethyleneterephthalate which forms a bottle as an inner layer, and wherein in case an outer layer of a neck is formed of transparent resin, it is extremely difficult to distinguish from a bottle of which whole portion is formed of polyethylene-terephthalate.

In the present invention having the aforesaid object, an outer layer of a neck of a polyethylene-terephthalate bottle with only a neck formed into a two-layered construction comprises an outer layer body preformed of resin having a heat resistance such as polycarbonate or crystallized polyethyleneterephthalate. This outer layer body is provided with an external shape of a bottle neck and is integrally formed in its outer peripheral surface with threads or the like necessary for a cap seal.

Also, an inner layer of a bottle neck is formed of polyethyleneterephthalate which forms a bottle, and an end of the inner layer is exposed at a neck opening to cover the upper end of said outer layer body to thereby move a joining line of two layers at the open end of the neck to a portion outside the cap seal edge, whereby even if the shrinkage rate is different between two layers which

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constitutes a bottle neck, a deviation resulting from said shrinkage difference is not extended to the open end of the neck.

Integration between the outer layer body and inner layer is achieved by insert molding when a preform or a parison is injection molded. The outer layer body integrally bonded to the inner layer by injection molding can prevent the inner layer of polyethyleneterephthalate from thermal deformation by heating from outside after molded, or can protect the neck so that even if thermal deformation should occur, such thermal deformation would not appear externally.

The outer layer body and inner layer are integrally formed when a preform or a parison is injection molded. However, they are never deposited each other but the joined surfaces of two layers are peeled by a great shock. Since the thermal deformation of the inner layer by the outer layer body is compensated for the first time when both the layers are completely joined, it is designed in the present invention that the inner layer and outer layer body are brought into engagement with each other at the opening of the neck, either inner layer or outer layer body is partly projected and embedded into the other layer and the outer layer body is secured even in a circumferential



direction of the bottle neck to prevent the outer layer body from being moved by the external force at the time of cap seal.

In the following, the present invention will be further described in detail by way of embodiments shown in the drawings.

#### 4. BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a longitudinal sectional front view of a neck of a polyethyleneterephthalate bottle in accordance with this invention.

Fig. 2 is an enlarged longitudinal sectional view of an open end of the neck.

Fig. 3 is a longitudinal sectional front view of a bottle neck in a second embodiment of the invention.

Fig. 4 is an enlarged longitudinal sectional view of an open end of said bottle neck.

Fig. 5 is a longitudinal sectional front view of a bottle neck in a third embodiment of the invention.

Fig. 6 is a sectional view taken on line V-V of Fig. 5.

Fig. 7 is a side view of an upper portion of an outer layer body.

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## 5. DESCRIPTION OF THE PREFERRED EMBODIMENTS

In the drawings, a reference numeral 1 designates a bottle formed of polyethyleneterephthalate and a reference numeral 2 designates a neck, which has a two-layered construction consisting of an inner layer 3 and an outer layer body 4.

The inner layer 3 is formed of polyethyleneterephthalate of which a bottle body is formed, and the outer layer body 4 in the form of an outer layer is formed of polycarbonate. This outer layer body 4 is injection molded together with cap threads 5 in the outer periphery thereof and has the same sectional shape as the external shape of the neck 2.

Joining of the inner layer 3 and outer layer body 4 can be easily accomplished by insert the outer layer body 4 into a cavity when a preform is molded. More specifically, the inner layer 3 can be molded merely by inserting the outer layer body 4 pre-injection molded into a neck mold of a preform and introducing polyethyleneterephthalate forming a preform between the outer layer body 4 and a core mold in the central portion of the cavity, and at the same the inner layer 3 is joined to the outer layer body 4 thereby forming the aforesaid neck 2 of a two-layered construction.

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As will be best shown in Fig. 2, the inner layer 3 is exposed at an opening of the neck and covers an upper end 4a of the outer layer body 4 to form an open end 2a of the neck. A distal end of the inner layer 3 is made to the same face as the outer surface of the outer layer body 4, and a seal edge 6 is formed by an upper end edge.

The outer layer body 4 is formed in its side with a through-hole 7 into which flows a part of polyethylene-terephthalate forming the inner layer 3 to form a projection 8. The projection 8 and the through-hole 7 are fitted whereby the outer layer body 4 is secured even in a circumferential direction of the neck 2.

In the bottle neck 2 formed into the two-layered construction as described above, a joining line for both layers is positioned at the side of the neck under the seal edge 6 by the distal end of the inner layer 3 which covers the upper end 4a of the outer layer body 4, and all the inside of a portion sealed by a packing 10 of a cap 9 is occupied by polyethyleneterephthalate forming the inner layer 3.

Accordingly, even if the outer layer body 4 is formed of polycarbonate, gas impermeability in the neck 2 is not impaired, and the inner layer 3 is protected from external heat, by the heat resisting outer layer body 4,

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as a consequence of which thermal deformation is hard to occur in the neck 2.

In the embodiments shown in Figs. 3 and 5, the inner layer 3 and outer layer body 4 are joined tightly each other so that even when contents having a relatively high filling temperature is filled, the neck 2 is prevented from occurrence of thermal deformation.

In the embodiment shown in Fig. 3, a shoulder 4b is formed externally of an upper end of the outer layer body 4 and the distal end 3a of the inner layer 3 is molded to the shoulder 4b whereby an end of the inner layer and an end of the outer layer body are brought into engagement with each other to prevent the thermal deformation of the inner layer end in a radial direction to the minimum.

The shape of the lower end of the outer layer body 4 is formed into the same shape as that of the upper surface of a support ring 11 integral with the lower side of the neck, and a sprue projected internally of said lower end is embedded as said projection 8 into the support ring 11 to secure the outer layer body 4 in a circumferential direction.

In the embodiment shown in Fig. 5, the inner layer 3 and outer layer body 4 are engaged each other more tightly at the opening of the neck. As shown in Fig. 7,

the predetermined number of convex portions 12, 12 and concave portions 13, 13 are radially alternately formed in the upper end 4a of the outer layer body 4, and the end of the inner layer 3 is molded on the convex portions 12, 12 and concave portions 13, 13 to cover the upper end 4a of the outer layer body, said concave portions 13, 13 being embedded by a part 3b of the inner layer 3 formed of polyethyleneterephthalate to alternately engage both the elements each other.

In such a construction, the inner layer 3 and outer layer body 4 are engaged each other in a circumferential direction to maintain engagement therebetween, and therefore, even if the inner layer 3 is molded to be thin in wall thickness, both the layers are more tightly joined and even if the inner layer 3 tends to be shrunk by heating, such shrinkage can be prevented by the open end of the neck.

Accordingly, in the bottle formed of polyethylene-terephthalate in accordance with the present invention, the bottle is excellent in heat resistance even if the neck 2 is not particularly heat treated, the thermal deformation of the neck which is liable to occur in heating and filling hardly occurs, and the gas impermeability of the neck can be kept. Moreover, the two-layered construction of the neck can be extremely easily obtained by making use of insert molding. In addition, where a bottle is molded by

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stretch blowing, an obstacle is not encountered by the two-layered construction of the neck but the injection stretch blowing heretofore employed can be applied for the manufacture of a bottle. Furthermore, when the outer layer body is formed of resin having a transparency such as polycarbonate, it is extremely difficult to distinguish the obtained article if the latter has a neck which is of the two-layered construction, not to impair the value as a bottle of polyethyleneterephthalate.

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WHAT IS CLAIMED IS:

1. In a bottle of polyethyleneterephtalate formed by stretch blowing wherein a portion from a lower portion of a neck to a bottom is subjected to bixial orientation and only the neck has a two-layered construction, a polyethyleneterephtalate with a two-layered neck characterized in that an outer layer of said neck comprises an outer layer body preformed of heat resisting resin such as polycarbonate or crystallized polyethyleneterephtalate with cap threads or the like molded in the outer periphery thereof, an inner layer of the neck is formed of polyethyleneterephtalate of which a bottle is formed, both of which layers are joined each other by insert molding prior to molding of a bottle, said inner layer being exposed at an opening of the neck and covering the upper end of said outer layer body, and an upper end edge is formed with a cap seal edge.

2. A polyethyleneterephtalate with a two-layered neck according to claim 1 wherein said outer layer body of said neck has a shoulder in an outer periphery of the upper end thereof, and a distal end of the inner layer covering the upper end of the outer layer body is brought into engagement with said shoulder.

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3. A polyethyleneterephthalate with a two-layered neck according to claim 1 wherein said upper end of said outer layer body is formed into concavo-convex surfaces, said upper end being covered by the end of said inner layer, and an end of the inner layer and an upper end of the outer layer are integrally engaged by said concavo-convex surfaces.

4. A polyethyleneterephthalate with a two-layered neck according to claim 1 wherein said outer layer body has a through-hole in the side thereof, and said through-hole and a projection projected on the side of said inner layer are fitted whereby the outer layer body is secured in a circumferential direction.

5. A polyethyleneterephthalate with a two-layered neck according to claim 1 wherein the lower portion of said outer layer body is formed to have the same shape as that of an upper surface of a support ring formed under the neck of the bottle, a sprue projected on the opening at the lower end is embedded into the support ring, and the outer layer body is secured in a circumferential direction.

6. A polyethyleneterephthalate with a two-layered neck according to claim 1 wherein the outer layer body is formed of polycarbonate.





European Patent  
Office

# EUROPEAN SEARCH REPORT

0144450

Application number:

EP 83 11 1536

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 7)
A	GB-A-2 078 194 (SUZUKI et al.) * Abstract; figures *	1	B 65 D 41/08 B 29 C 17/07
A	FR-A-2 440 824 (ERB) * Claims; figure 2 *	1,2	
A	GB-A-2 047 606 (OTA et al.) * Whole document *	1-5	
A	PLASTICS ENGINEERING, vol. 37, no. 3, March 1981, pages 83-87, Manchester, New Hampshire, US; J.L. SZAJNA: "What every designer of plastic bottles should know about structure" * Table on page 83 *	1,6	
A	DE-U-1 906 897 (KORZILIUS) * Figure 1 *	4	TECHNICAL FIELDS SEARCHED (Int. Cl. 7)
A	EP-A-0 073 151 (HAYASHI et al.)		B 65 D B 29 C
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 03-07-1984	Examiner BENZE W.E.
<p><b>CATEGORY OF CITED DOCUMENTS</b></p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons &amp; : member of the same patent family, corresponding document</p>			